

CLAIMS

What is claimed is:

1. A light valve for use in high contrast reflective microdisplays, comprising:
a light source that emits non-polarized light;
5 a homeotropic vertically aligned nematic mode reflective liquid crystal cell;
a first circular polarizer positioned in the path of the light between said light source and said liquid crystal cell; and
a second circular polarizer positioned in the path of the light reflected by said liquid crystal cell.
- 10 2. The light valve of claim 1 wherein said light is generally on-axis to said first circular polarizer, said liquid crystal cell, and said second circular polarizer.
3. The light valve of claim 1 wherein said light is generally off-axis to said first circular polarizer, said liquid crystal cell, and said second circular polarizer.
4. The light valve of claim 1 wherein at least one circular polarizer is comprised of a
15 linear polarizer and a quarter wave retarder.
5. The light valve of claim 1 wherein at least one circular polarizer is a cholesteric film.
6. The light valve of claim 1, wherein said liquid crystal cell is an LCoS cell.
7. The light valve of claim 1, wherein said liquid crystal cell is a perfectly
20 homeotropic vertically aligned nematic mode reflective liquid crystal cell.
8. The light valve of claim 1, wherein said liquid crystal cell has no director pre-tilt.
9. A light valve for use in high contrast reflective microdisplays, comprising:
a light source that emits non-polarized light;
a homeotropic vertically aligned nematic mode reflective liquid crystal cell;
25 a first circular polarizer positioned between said light source and said liquid crystal cell;
a non-polarizing beam splitter positioned to reflect the light exiting said first circular polarizer toward said liquid crystal cell; and
a second circular polarizer positioned in the path of the light reflected by said
30 liquid crystal cell;

wherein the light is generally on-axis to said first circular polarizer, said liquid crystal cell, and said second circular polarizer.

10. The light valve of claim 9 wherein at least one circular polarizer is comprised of a linear polarizer and a quarter wave retarder.

5 11. The light valve of claim 9 wherein at least one circular polarizer is a cholesteric film.

12. The light valve of claim 9, wherein said liquid crystal cell is an LCoS cell.

13. The light valve of claim 9, wherein said liquid crystal cell is a perfectly homeotropic vertically aligned nematic mode reflective liquid crystal cell.

10 14. The light valve of claim 9, wherein said liquid crystal cell has no director pre-tilt.

15. The light valve of claim 9, wherein said first circular polarizer and said second circular polarizer are of opposite handedness.

16. A light valve for use in high contrast reflective microdisplays, comprising:

a light source that emits non-polarized light;

15 a homeotropic vertically aligned nematic mode reflective liquid crystal cell;

a first circular polarizer positioned between said light source and said liquid crystal cell; and

a second circular polarizer positioned in the path of the light reflected by said liquid crystal cell;

20 wherein light is generally off-axis to said first circular polarizer, said liquid crystal cell, and said second circular polarizer.

17. The light valve of claim 16 wherein at least one circular polarizer is comprised of a linear polarizer and a quarter wave retarder.

25 18. The light valve of claim 16 wherein at least one circular polarizer is a cholesteric film.

19. The light valve of claim 16, wherein said liquid crystal cell is an LCoS cell.

20. The light valve of claim 16, wherein said liquid crystal cell is a perfectly homeotropic vertically aligned nematic mode reflective liquid crystal cell.

30 21. The light valve of claim 16, wherein said liquid crystal cell has no director pre-tilt.

22. The light valve of claim 16, wherein said first circular polarizer and said second circular polarizer are of the same handedness.

23. The light valve of claim 16, wherein said first circular polarizer and said second circular polarizer are generally parallel to said liquid crystal cell.

5 24. A method of utilizing a homeotropic vertically aligned nematic mode reflective liquid crystal cell having no pre-tilt inducing mechanism to produce a high contrast microdisplay, comprising the steps of:

passing non-polarized light from a light source through a first circular polarizer;

10 reflecting circularly polarized light off a bottom substrate of a reflective liquid crystal cell; and

passing light reflected off said bottom substrate through a second circular polarizer.

25. The method of claim 24 wherein at least one circular polarizer is comprised of a linear polarizer and a quarter wave retarder.

15 26. The method of claim 24 wherein at least one circular polarizer is a cholesteric film.

27. The method of claim 24, wherein said liquid crystal cell is an LCoS cell.

28. The method of claim 24, wherein said liquid crystal cell is a perfectly homeotropic vertically aligned nematic mode reflective liquid crystal cell.

20 29. A structure for controlling the transmission of light for use in high contrast reflective microdisplays, comprising:

a light source that emits non-polarized light;

a homeotropic vertically aligned nematic mode reflective liquid crystal cell;

25 a first circular polarizer positioned between said light source and said liquid crystal cell; and

a second circular polarizer positioned in the path of light reflected from said liquid crystal cell.

30. A light valve for use in direct view reflective liquid crystal displays, comprising:

a light source that emits non-polarized light;

30 a homeotropic vertically aligned nematic mode reflective liquid crystal cell;

a circular polarizer positioned between said light source and said liquid crystal cell

wherein light emitted by said light source is incident to said circular polarizer, and wherein light reflected by said liquid crystal cell is incident to said circular polarizer.

5 31. The light valve of claim 30 wherein said circular polarizer is comprised of a linear polarizer and a quarter wave retarder.

 32. The light valve of claim 30 wherein said circular polarizer is a cholesteric film.

 33. The light valve of claim 30, wherein said liquid crystal cell is an LCoS cell.

 34. The light valve of claim 30, wherein said liquid crystal cell is a perfectly
10 homeotropic vertically aligned nematic mode reflective liquid crystal cell.

 35. The light valve of claim 30, wherein said liquid crystal cell has no director pre-tilt.

 36. The light valve of claim 30, wherein said circular polarizer is generally parallel to said liquid crystal cell.

15 37. A method of utilizing a homeotropic vertically aligned nematic mode reflective liquid crystal cell having no pre-tilt inducing mechanism to produce a high contrast direct view display, comprising the steps of:

 passing non-polarized light from a light source through a circular polarizer;

 reflecting circularly polarized light off a bottom substrate of a reflective liquid
20 crystal cell; and

 passing light reflected off said bottom substrate through said circular polarizer.

 38. The method of claim 37 wherein said circular polarizer is comprised of a linear polarizer and a quarter wave retarder.

 39. The method of claim 37 wherein said circular polarizer is a cholesteric film.

25 40. The method of claim 37, wherein said liquid crystal cell is an LCoS cell.

 41. The method of claim 37, wherein said liquid crystal cell is a perfectly homeotropic vertically aligned nematic mode reflective liquid crystal cell.